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APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
08/690,909	08/01/96	BONIN	W 55463-101-10

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EXAMINER	
LARKIN, D	
ART UNIT	**PAPER NUMBER**
2212	7

DATE MAILED: 05/06/97

This is a communication from the examiner in charge of your application.
COMMISSIONER OF PATENTS AND TRADEMARKS

OFFICE ACTION SUMMARY

☒ Responsive to communication(s) filed on 25 February 1997.

☒ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 D.C. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire THREE (3) month(s), ~~or thirty days, whichever is longer,~~ from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) 41-64 is/are pending in the application.

Of the above, claim(s) ______ is/are withdrawn from consideration.

☐ Claim(s) ______ is/are allowed.

☒ Claim(s) 41-64 is/are rejected.

☐ Claim(s) ______ is/are objected to.

☐ Claims ______ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on ______ is/are objected to by the Examiner.

☒ The proposed drawing correction, filed on 25 February 1997 ~~is~~ ☒ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) ______.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: ______.

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☐ Notice of Reference Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). ______

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

– SEE OFFICE ACTION ON THE FOLLOWING PAGES –

1. The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on 25 February 1997 have been approved b the Examiner.

2. The specification is objected to because it does not include certain reference signs shown in the drawings. 37 CFR § 1.84(f) states, "Reference signs not mentioned in the description shall not appear in the drawing and vice versa." The following reference signs are not mentioned in the description:

Numerals -- **40** -- and -- **42** -- of newly amended Figure 1 do not appear in the specification. Correction is required.

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 C.F.R. § 1.75(d)(1) and M.P.E.P. § 608.01(l). Correction of the following is required:

Claim 45: Utilizing means responsive to the position of the pick-up plate in conjunction with a scanning probe which also includes "means for applying an AC signal to the drive plate".

NOTE: The specification provides no disclosure that the force controller 64 or the STM controller 60 performs the function of providing an AC signal to the drive plate since the force controller is responsible for converting an output signal which is representative of the position of the pick-up plate into a value proportional to the force applied to the plate. Furthermore, the disclosure provides no statement which suggests that the force controller or the STM controller of Figure 2 and the means for providing a carrier signal of Figure 1 are one in the same.

Claim 46: Utilizing means responsive to the position of the pick-up plate in conjunction with a scanning probe which also synchronously demodulates the output signal to produce a DC signal proportional to the displacement of the pick-up plate.

NOTE: The specification provides no disclosure that the force controller 64 performs the function of synchronously demodulating the output signal to produce a DC signal proportional to the displacement of the pickup plate. Although the force controller is responsible for converting an output signal which is representative of the position of the pick-up plate into a value proportional to the force applied to the plate, no mention has been made that the force controller of Figure 2 and the means for reading the output of the sensor element 2 of Figure 1 are one in the same.

Claim 56: Providing a sensor which utilizes means for providing an output signal representative of the surface property being measured in conjunction with a scanning probe which also includes "means for applying an AC signal to the drive plate".

NOTE: The specification provides no disclosure that the force controller 64 or the STM controller 60 performs the function of providing an AC signal to the drive plate since the force controller is responsible for converting an output signal which is representative of the position of the pick-up plate into a value proportional to the force applied to the plate. Furthermore, the disclosure provides no statement which suggests that the force controller or the STM controller of Figure 2 and the means for providing a carrier signal of Figure 1 are one in the same.

5. Claims 45, 46, and 56-64 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to

enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Re claim 45: The specification fails to disclose means responsive to the position of the pick-up plate for use in conjunction with a scanning probe which also includes "means for applying an AC signal to the drive plate". The disclosure provides no statement which suggests that the force controller or the STM controller of Figure 2 and the means for providing a carrier signal of Figure 1 are one in the same.

Re claim 46: The specification fails to disclose means responsive to the position of the pick-up plate for use in conjunction with a scanning probe which synchronously demodulates an output signal to produce a DC signal proportional to the displacement of the pick-up plate. No mention has been made that the force controller of Figure 2 and the means for reading the output of the sensor element 2 of Figure 1 are one in the same.

Re claim 56: The specification fails to disclose "means for applying an AC signal to the drive plates" whereby one signal to one drive plate is 180 degrees out of phase with the signal applied to the other drive plate are provided with a sensor which utilizes means for providing an output signal representative of the surface property being measured in conjunction with a scanning probe. The disclosure provides no statement which suggests that the force controller or the STM controller of Figure 2 and the means for providing a carrier signal of Figure 1 are one in the same.

6. Claims 41-46 are objected to because of the following informalities:

Re claim 41, section 2, line 2: The conjunction -- and -- should be inserted after the word "plate". Appropriate correction is required.

7. Claims 45, 46, 50 and 56-64 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Re claim 45: Where is it disclosed that means responsive to the position of the pick-up plate for use in conjunction with a scanning probe which also includes "means for applying an AC signal to the drive plate"?

Re claim 46: Where is it disclosed that means responsive to the position of the pick-up plate for use in conjunction with a scanning probe also includes synchronously demodulating the output signal to produce a DC signal proportional to the displacement of the pick-up plate?

Re claim 50: The phrase "the means for measuring the output signal of the force sensor" lacks antecedent basis.

Re claim 56: Where is it disclosed that "means for applying an AC signal to the drive plates" whereby one signal to one drive plate is 180 degrees out of phase with the signal applied to the other drive plate are provided with a sensor which utilizes means for providing an output signal representative of the surface property being measured in conjunction with a scanning probe?

8. Claims 41, 42, and 45-47 are rejected under 35 U.S.C. § 102(b) as being anticipated by Thomas. The reference to Thomas discloses a first capacitive transducer (10) which utilizes a metal disc shaped plate (22) as a pick-up plate and electrodes A, A' and B, B' as drive plates for detecting displacement of the pick-up plate (22) in a first direction. The pick-up plate (22) is connected to a lever (12) which transmits a force to the plate (22) and thereby changes the capacitance of the device (10) as the metal plate (22) is manually manipulated.

The disclosure also states that the lever (12) can be used as a stylus for contacting a workpiece (i.e. a force sensor) (col. 2, lines 45-48). A signal conditioning system is provided for providing an output signal which is linearly proportional to the displacement of the pick-up plate/electrode (22). An alternate embodiment of the device shown in Figure 10 provides for a sinusoidal AC oscillator (142) which provides a signal to a transformer (T2) which has its two ends connected to plates A and B of the differential transducer (30). Another embodiment of the device provides for a charge amplifier (48) to receive the signal produced on the pick-up plate/central electrode (22) and then sending the output of the charge amplifier (48) to a phase sensitive rectifier (50) which acts as a synchronous demodulator to produce a DC signal. The signal from the phase sensitive rectifier (50) is later digitized such that the digital output is linearly proportional to the displacement of the pick-up plate/electrode (22).

9. Claims 43, 44, 48, 49, and 51-55 are rejected under 35 U.S.C. § 103 as being unpatentable over Thomas as applied to claims 41 and 47 above, and further in view of Slinkman et al. and Burnham et al. (5,193,383). The reference to Thomas fails to disclose means for utilizing the output signal to control a movement of the scanning head relative to the sample or means for providing an image of the surface topography based upon the output signal. The reference to Slinkman et al. discloses a scanning capacitance-voltage microscope which utilizes a probe tip which is movable in the X, Y, and Z directions. A capacitance sensor gathers signals from the probe tip and outputs a signal used by a computer to generate a capacitance display. A proximity sensor is provided to monitor the spacing between the probe tip and the sample. An output signal from the proximity sensor is used in a feedback control device for moving the probe tip in the needed direction. The topography of the sample is also displayed. Burnham et al. ('383) disclose a surface force nanoprobe which has

the ability to either measure surface imaging capabilities like a scanning force microscope by using a probe which can be monitored using capacitive detection means or provide a probe to measure the hardness of samples through indentation. A computer is used to gather output signals and a monitor is provided to display the surface image. The monitor is coupled to the feedback electronics and the force probe can be adjusted by the operator to measure three different measurements. It would have been obvious for one of ordinary skill in the art to have provided a means for providing an image of the output signals so as determine the various mechanical properties of the sample. The operator control would also have been obvious for one of ordinary skill in the art as a means to control the measuring process and to possibly prevent damage to either prevent damage to the sample by an aggressive probe strike or to the probe tip contacting a hard surface. It would have been obvious for one of ordinary skill in the art to have provided a feedback type mechanism to control the movement of the scanning head so as to provide more accurate measurements by allowing the scanning head to be more easily and accurately positioned with respect to the sample surface. Although the reference fails to disclose maintaining a constant force while the surface property is measured, the Examiner deems this limitation to be well known to those in the scanning probe microscopy field given that the most popular forms of scanning involve either maintaining a constant height between the sample and the probe tip or maintaining a constant force between the probe tip and the sample.

10. Claim 43, 44, and 48-50 are rejected under 35 U.S.C. § 103 as being unpatentable over Thomas as applied to claims 41 and 47 above, and further in view of Weissenbacher et al. The reference to Thomas fails to disclose means for maintaining a constant force of the sample, means for applying a downward force to the probe, and means for converting the

output signal of the force sensor into a signal representative of the force of an indentation test. It would have been obvious for one of ordinary skill in the art to have provided a means for applying a downwards force to the probe as well as a means to maintain the force between the sample and the probe tip is constant because Weissenbacher et al. disclose a hardness tester used for indentation testing of samples whereby the indentor is connected with a force gauge which emits an electronic signal corresponding to the load applied to the sample. The output signals of the force gauge are provided to a drive unit through a comparator circuit which provides a mechanism for moving the indentor to contact the sample surface. The motor for driving the indentor maintains a constant load on the sample.

11. Claims 56-58 and 60-64 are rejected under 35 U.S.C. § 103 as being unpatentable over Thomas in view of Bonin et al., Slinkman et al., and Burnham et al. (5,193,383). The reference to Thomas discloses a first capacitive transducer (10) which utilizes a metal disc shaped plate (22) as a pick-up plate and electrodes A, A' and B, B' as drive plates for detecting displacement of the pick-up plate in a first direction. The pick-up plate (22) is connected to a lever (12) which transmits a force to the plate (22) and thereby changes the capacitance of the device (10) as the metal plate (22) is manually manipulated. The disclosure also states that the lever (12) can be used as a stylus for contacting a workpiece (i.e. a force sensor) (col. 2, lines 45-48). A signal conditioning system is provided for providing an output signal which is linearly proportional to the displacement of the pick-up plate/electrode (22). An alternate embodiment of the device shown in Figure 10 provides for a sinusoidal AC oscillator (142) which provides a signal to a transformer (T2) which has its two ends connected to plates A and B of the differential transducer (30). The transformer (T2) feeds phase and antiphase sinusoidal signals to the electrode plates A and B. The

reference to Thomas fails to suspend the central plate electrode by spring means. Bonin et al. disclose a capacitive accelerometer having two outer substrates with an inner and outer metalized surface, two spacer substrates, and a third substrate with an etched metal plate which displaces accordingly in response to acceleration changes due to its spring/plate arrangement. It would have been obvious for one of ordinary skill in the art to have modified the central plate of Thomas to appear more like that of Bonin et al. so as to allow the central plate to remain more stabile within the force sensor arrangement. The references to Thomas and Bonin et al. both fail to disclose means for providing an output signal which is representative of the surface property being measured, means for utilizing the output signal to control a movement of the scanning head relative to the sample, or means for providing an image of the surface topography based upon the output signal. The reference to Slinkman et al. discloses a scanning capacitance-voltage microscope which utilizes a probe tip which is movable in the X, Y, and Z directions. A capacitance sensor gathers signals from the probe tip and outputs a signal used by a computer to generate a capacitance display. A proximity sensor is provided to monitor the spacing between the probe tip and the sample. An output signal from the proximity sensor is used in a feedback control device for moving the probe tip in the needed direction. The topography of the sample is also displayed. Burnham et al. ('383) disclose a surface force nanoprobe which has the ability to either measure surface imaging capabilities like a scanning force microscope by using a probe which can be monitored using capacitive detection means or provide a probe to measure the hardness of samples through indentation. A computer is used to gather output signals and a monitor is provided to display the surface image. The monitor is coupled to the feedback electronics and the force probe can be adjusted by the operator to measure three different measurements.

It would have been obvious for one of ordinary skill in the art to have provided a means for providing an image of the output signals so as determine the various mechanical properties of the sample. The operator control would also have been obvious for one of ordinary skill in the art as a means to control the measuring process and to possibly prevent damage to either prevent damage to the sample by an aggressive probe strike or to the probe tip contacting a hard surface. It would have been obvious for one of ordinary skill in the art to have provided a feedback type mechanism to control the movement of the scanning head so as to provide more accurate measurements by allowing the scanning head to be more easily and accurately positioned with respect to the sample surface. Although the reference fails to disclose maintaining a constant force while the surface property is measured, the Examiner deems this limitation to be well known to those in the scanning probe microscopy field given that the most popular forms of scanning involve either maintaining a constant height between the sample and the probe tip or maintaining a constant force between the probe tip and the sample.

12. Claims 57-59 are rejected under 35 U.S.C. § 103 as being unpatentable over Thomas in view of Bonin et al., Slinkman et al., and Burnham et al. (5,193,383) as applied to claim 56 above, and further in view of Weissenbacher et al. The references to Thomas and Bonin et al., Slinkman et al., and Burnham et al. ('383) all fail to disclose means for maintaining a constant force of the sample and means for converting the output signal of the force sensor into a signal representative of the force of an indentation test. It would have been obvious for one of ordinary skill in the art to have provided a means for applying a downwards force to the probe as well as a means to maintain the force between the sample and the probe tip is constant because Weissenbacher et al. disclose a hardness tester used for indentation testing

of samples whereby the indentor is connected with a force gauge which emits an electronic signal corresponding to the load applied to the sample. The output signals of the force gauge are provided to a drive unit through a comparator circuit which provides a mechanism for moving the indentor to contact the sample surface. The motor for driving the indentor maintains a constant load on the sample.

13. Applicant's arguments filed 25 February 1997 have been fully considered but they are not deemed to be persuasive.

In response to the Applicant's arguments, page 5, lines 19-26 through page 6, lines 1-3, that the reference to Thomas fails to disclose a scanned probe microscope apparatus having a probe and scanning head or a scanned probe microscope apparatus having a high precision capacitance sensor having a pick-up plate movably mounted relative to a drive plate, means for transmitting force between an object remote from the pick-up plate and the pick-up plate, and means responsive to the position of the pick-up plate relative to the drive plate for providing an output signal proportional to the relative position, the Examiner respectfully disagrees. Firstly, with respect to the argument regarding a scanned probe microscope, apparatus claims are defined by their structure and not their intended use. The only structure claimed is a high precision capacitance sensor, means for transmitting force, and means responsive to the position of the pick-up plate. The preamble does not breath life and breath into the structure of the claims; therefore, the intended limitations within the preamble are not given patentable consideration. With respect to the structural limitations of the claims, the reference to Thomas discloses a force sensor (10) which utilizes a metal disc shaped plate (22) acting as a pick-up plate and electrodes A, A' and B, B' acting as drive plates for detecting displacement of the pick-up plate (22) in a first direction. A stylus (12) is attached

to the pick-up plate (22) for transmitting force to the plate (22) which thereby changes the capacitance of the device (10) as the metal plate (22) is manually manipulated. A signal conditioning system is provided for providing an output signal which is linearly proportional to the displacement of the pick-up plate/electrode (22). It should be noted that as this stylus contacts a specimen, force will be transmitted from the stylus tip to the pick-up plate.

In response to the Applicant's arguments, page 6, lines 4-17, that the reference to Thomas fails to disclose a scanned probe microscope apparatus having a probe and scanning head or a scanned probe microscope apparatus having a force sensor operably located wherein the force sensor comprises a pair of capacitance transducers, each transducer having a separate drive plate and a shared pick-up plate movably suspended between the two drive plates and means for transmitting force from a point remote from the pick-up plate to the pick-up plate, the Examiner respectfully disagrees. Firstly, with respect to the argument regarding a scanned probe microscope, apparatus claims are defined by their structure and not their intended use. The only structure claimed is a force sensor having a capacitance sensor and means for transmitting force. Again, the preamble fails to breathe life and breath into the structure of the claims; therefore, the intended limitations within the preamble are not given patentable consideration. With respect to the structural limitations of the claims, see above arguments respecting claim 41.

With respect to the Applicant's arguments of page 7, lines 10-26 through page 8, lines 1-26, the Examiner respectfully points out that again an apparatus claim is define by the structure claimed. The reference to Thomas teaches the specifics of the capacitance sensor except for a spring mounted pick-up plate. The reference to Bonin discloses a capacitive force sensor in which a spring mounted pick-up plate is mounted between two drive plates.

The references to Thomas and Bonin are analogous and one of ordinary skill in the art would look to Bonin to find solutions to the problems associated in the reference to Thomas. As to the Applicant's argument that the references fail to disclose means for providing an output signal representative of the surface property being measured, the Examiner argues that one of ordinary skill in the art could easily obtain a surface measurement from the Thomas reference even though no measuring means is explicitly defined. One of ordinary skill in the art would have the ability to measure surface properties simply by knowing the resistance to deflection of the pick-up plate and the capacitance values created when the pick-up plate is deflected. Burnham et al. is utilized to teach that a capacitance value can be used to define specific properties of a sample surface. Although the probe used by Burnham et al. is shaped as a cantilever, it is well known in the scanning probe art that scanning probes used in capacitive type measurements can use probes which are not shaped as cantilevers. Furthermore, Burnham et al. is used to teach only the processing of the capacitive measurements and not necessarily the structure used to gather the information (i.e. a cantilevered probe).

NOTE: The rejections of paragraphs 4-7 have not been addressed since the amendment on page 1 could not be made because the amendment makes reference to a "probe 50" on page 13, line 3 of the specification where there is none. Correction is needed.

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 C.F.R. § 1.136(a).

A SHORTENED STATUTORY PERIOD FOR RESPONSE TO THIS FINAL ACTION IS SET TO EXPIRE THREE MONTHS FROM THE DATE OF THIS ACTION. IN THE EVENT A FIRST RESPONSE IS FILED WITHIN TWO MONTHS OF THE MAILING DATE OF THIS FINAL ACTION AND THE ADVISORY ACTION IS NOT MAILED UNTIL AFTER THE END OF THE THREE-MONTH SHORTENED

STATUTORY PERIOD, THEN THE SHORTENED STATUTORY PERIOD WILL EXPIRE ON THE DATE THE ADVISORY ACTION IS MAILED, AND ANY EXTENSION FEE PURSUANT TO 37 C.F.R. § 1.136(a) WILL BE CALCULATED FROM THE MAILING DATE OF THE ADVISORY ACTION. IN NO EVENT WILL THE STATUTORY PERIOD FOR RESPONSE EXPIRE LATER THAN SIX MONTHS FROM THE DATE OF THIS FINAL ACTION.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel Larkin whose telephone number is (703) 308-6724. The examiner can normally be reached on Monday-Friday from 7:00 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hezron E. Williams, can be reached on (703) 305-4705. The FAX telephone number for this Group (Group 2200, unit 2212) is (703) 308-7382.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 305-4900.

Daniel Larkin

DANIEL S. LARKIN
PATENT EXAMINER
GROUP 2200

29 April 1997

Hezron E. Williams

HEZRON E. WILLIAMS
SUPERVISORY PATENT EXAMINER
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